REMARKS/ARGUMENTS

This is in response to the final Office Action mailed April 3, 2003, in the above-referenced application. Claims 1-16 and 26 are pending. Applicant respectfully requests entry and consideration of the foregoing claim amendments. The amendments do not raise new issues for consideration by the Examiner or alternatively place the application into better form for appeal.

As known in the art, green liquor (sodium carbonate dissolved in water) is produced in wood pulping processes. The green liquor is desirably treated so as to convert the carbonate to hydroxide. The hydroxide can then be recycled and reused in pulping processes.

The process of converting the carbonate to hydroxide is typically referred to as a causticizing process. The causticizing process is carried out in a "slaker" and a series of "causticizers" to produce a material known as white liquor, which desirably has a high degree of hydroxide and only a small amount of carbonate. Thus, the causticizing process can include a slaking process in which the green liquor is reacted with lime (CaO) to form lime milk, or hydrated lime ($Ca(OH)_2$). The lime milk is directed to one or more causticizers in which the hydrated lime reacts with sodium carbonate from the green liquor to form sodium hydroxide and lime mud (calcium carbonate, $CaCO_3$).

Variables within the process can affect the quality of the end product. Various techniques have been proposed in an attempt to better control the quality of the end product. Such prior techniques, however, can suffer from lack of accuracy.

The present invention provides more accurate control of the causticizing process, and thus provides an improved hydroxide product. In particular, the present invention provides better control of the causticizing process by controlling the density of a green liquor inlet stream based on the total titratable alkali (or "TTA") thereof. As recited in Claim 1 the density of the green liquor entering the process can be determined based upon the measured total titratable alkali of the stream. After the green liquor density is determined based upon a measured value of the total titratable alkali, the green liquor density can be controlled, or adjusted, as needed. Claim 1 is amended to make it more readable and to highlight the process steps recited therein.

Claim 26 highlights further advantageous aspects of the invention. In this aspect of the invention, the total titratable alkali of a green liquor inlet stream is measured. The density of the green liquor inlet stream is then determined based upon the measured total titratable alkali and the density adjusted by introducing an effective amount of a white liquor stream into the green liquor inlet stream.

Claims 1-16 and 26 are rejected under 35 USC § 112, second paragraph, as indefinite. Applicant offers the following comments.

The Office argues that chemical reactions should be set forth in the process claims. Applicant respectfully submits, however, that the claims recite sufficient information regarding the chemical reactions involved in the process. In this regard, Claim 1 recites a method for controlling a causticizing process which includes slaking, causticizing and white liquor preparation steps. Causticizing processes are known to those skilled in the art, and the skilled artisan would understand the specifics of the chemical reactions involved in each of these steps, particularly in view of the teachings of the specification, for example, at page 7, line 28 through page 8, line 32. The same is true for independent Claim 26.

The Office rejects Claim 10, arguing that the term "a production curve" is unclear. Applicant directs the Examiner's attention to page 12, lines 18-23 and Figure 7 of the specification, which clearly define this term.

The Office rejects Claim 7, arguing that the term "dynamic" is unclear. Again, Applicant respectfully submits that the term "dynamic" is definite in view of the teachings of the specification, for example, at page 11, line 19, through page 12, line 6.

The Office rejects Claim 8, arguing that the claim seems to state that if the temperature is too high, then the temperature is changed so it is also too high. Applicant respectfully disagrees with this interpretation of Claim 8. Claim 8 states that the lime to green liquor ratio is controlled using a temperature difference control. When the measured temperature deviates from the temperature target, the lime to green liquor ratio target is changed in the opposite direction. Applicant does not understand the Examiner's argument because Claim 8 specifically recites modifying a lime to green liquor ratio target in the opposite direction of the measured temperature, and not increasing the temperature when the measured temperature is too high.

The Office argues that the term "model" is unclear with respect to how the model works and how values are calculated. As discussed above, the invention correlates the measured total titratable alkali of a green liquor stream to the density of the green liquor stream. With this value in hand, the operator can then readily adjust the green liquor density as necessary, for example by introducing white liquor stream into the green liquor stream as recited in Claim 26, to provide the desired end product.

One skilled in the art would understand the mathematics involved in this calculation based upon the chemistry of the causticizing process. The skilled artisan could therefore readily determine the relationship between TTA and density of the green liquor stream and implement any adjustments necessary to the green liquor stream to provide the desired downstream product. The nexus, i.e. the mathematic relationship, between the density and the TTA is also clearly defined within the application as filed, for example on page 9, line 31 through page 10, line 9. This correlation can be readily calculated manually or using a computer program. In either instance, the skilled artisan would understand the "model" or calculations that correlate these values. Applicant notes that the invention is not just the application of a mental model or mathematical algorithm because the claims also recite a specific process step to modify a reagent stream in response to this calculation, therefore resulting in a useful, concrete and tangible result.

Claim 4 is amended to clarify that the model is a static one that determines, instead of produces, a causticity difference. Support for this amendment can be found on page 10, line 30 through page 11, line 18.

Claim 26 is amended to delete the term "weak."

Applicant accordingly respectfully submits that the claimed invention is definite and requests withdrawal of this rejection.

Claims 1-16 and 26 are rejected under 35 USC § 112, first paragraph, as containing subject matter which does not meet the written description requirement. Applicant offers the following comments.

As a preliminary matter, Applicant respectfully notes that the Office does not set forth specific objections to Claim 26. Rather, the Office's comments are directed to Claims 1 and 11. Accordingly Applicant submits that the written description rejection of Claim 26 must be withdrawn.

The Office objects to Claim 11 and the term "coefficient." Applicant respectfully submits that the specification does describe how to calculate this value and how to determine when the model/target is wrong. The Examiner's attention is directed to the application as filed, for example on page 10, lines 10 through 15, in which the specification notes both a specific range of values and a preferred value for the coefficient. One skilled in the art would know how to arrive at a value for the coefficient, particularly in light of the disclosure within the specification.

Applicant submits that Claim 1 is also adequately described in the specification. Claim 1 recites the steps of: (1) determining the density of the green liquor stream based on a model correlating green liquor density and TTA; and (2) controlling the green liquor density based on this value. Claim 1 correctly recites a "controlling" step, and not a "calculating" step. As discussed above, the operator can control (or modify) the density of the green liquor stream as necessary to provide the desired end product, i.e., make any necessary adjustments to the inlet stream so as provide the desired density. Thus, as also noted above, the invention is not just the application of a mental model or mathematical algorithm because the claims also recite a specific process step in which the a reagent stream is controlled or modified as necessary in response to this calculation, therefore resulting in a useful, concrete and tangible result. The claimed invention does not mere calculate the density of the green liquor but controls the density as needed in response to TTA measurements.

Applicant accordingly respectfully requests withdrawal of this rejection as well.

Claims 1-16 and 26 are rejected under 35 USC § 103 as unpatentable over Baines taken with Mosow. Applicant respectfully traverses this rejection.

The Office relies upon Baines as teaching computer control of a causticizing process. Baines states that there are two categories of measurements made of the liquors and the process described therein, namely, "ambient measurements" and "liquor component measurements."

Page 8, lines 13-16. The ambient measurements include temperature, pressure, pH, flow rate, and density of the liquor as it is processed through the slaker and causticizers. The liquor component measurements include the relative concentrations of the primary components (NaOH, Na_2CO_3 and Na_2S) of the green and white liquors. Thus Baines measures different characteristics of the liquor streams than the claimed invention. Indeed, Baines nowhere teaches or suggests measuring total titratable alkali and using this measurement as a basis for controlling the causticizing process.

Baines also differs from the claimed invention with regard to the approach used to obtain measurements of the various parameters of the process streams. In particular, Baines relies upon measurements made using a polarographic process, based on the electrical conductivity induced over a voltage spectrum. The claimed invention does not rely upon conductivity measurements to determine the total titratable alkali within the green liquor inlet stream. Thus, not only does Baines measure different components of the various streams in the causticizing process, as compared to the claimed invention, Baines relies upon a different measurement than that as claimed.

Indeed, Baines actually teaches away from the claimed invention. Baines states that determining the relative concentrations of the liquor components, as opposed to a measurement of a characteristic of the total liquor, is critical to the successful implementation of the invention. Page 8, lines 30-32. Thus Baines teaches away from relying upon a measurement of a characteristic of the total liquor, such as total titratable alkali used in the claimed invention. Baines instead relies upon measurements of a plurality of different parameters of the liquor streams. Thus, Baines differs significantly with respect to the approach taken to control the causticizing process as compared to the claimed invention.

Mosow does not overcome the deficiencies of Baines. Mosow also relies upon conductivity measurements to determine concentrations of a component of a steam during a causticizing process, in particular to determine sodium carbonate concentration Further, Mosow actually teaches away from the claimed invention, stating that the method described therein is more accurate than indirect measures such as that of the density or total titratable alkali in a green liquor. Column 2, lines 58-62.

Neither of the cited references, whether considered singly or in combination, teach or suggest the claimed invention. Both of the cited references are directed to techniques utilizing conductivity measurements to control a causticizing process. The claimed invention does not rely upon conductivity measurements. Further, both of the cited references rely upon measurements of different stream components than that in the present invention. Neither reference teaches or suggests controlling a causticizing process by measuring total titratable alkali within a green liquor inlet stream and adjusting the density of the green liquor inlet stream based upon this measurement.

Indeed, the cited references teach away from the claimed invention. Baines teaches that determining the relative concentrations of a number of different green and white liquor components is required, as opposed to a measurement of a characteristic of the total liquor. Mosow specifically teaches away from the use of either density or total titratable alkali.

Accordingly, there is no motivation to combine the references as suggested by the Examiner. Even if the teachings of the references were combined, the result would not be the same as that claimed, because the references measure different stream components in an entirely different manner than claimed. Indeed, the references actually teach away from the claimed invention. Applicant accordingly respectfully requests withdrawal of this rejection as well.

The rejections of record having been addressed in full in the foregoing. Applicant respectfully submits that this application is now in condition for allowance, which action is respectfully solicited. Should the Examiner have any questions regarding the foregoing, it is respectfully requested that he contact the undersigned at his convenience.

It is not believed that extensions of time or fees for net addition of claims are required, beyond those that may otherwise be provided for in documents accompanying this paper. However, in the event that additional extensions of time are necessary to allow consideration of this paper, such extensions are hereby petitioned under 37 CFR § 1.136(a), and any fee required

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therefore (including fees for net addition of claims) is hereby authorized to be charged to Deposit Account No. 16-0605.

Respectfully submitted,

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September 3, 2003
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